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PROCEEDINGS OF SCIENTIFIC SOCIETIES.

American Association for the Advancement of Science.—The fortieth meeting of this body met in Washington, D. C., from August 19th to 25th, inclusive. The officers were: *President,* Albert B. Prescott, Ann Arbor, Mich. *Vice Presidents,* (A) Mathematics and Astronomy—E. W. Hyde, Cincinnati, Ohio; (B) Physics—F. E. Nipher, St. Louis, Mo.; (C) Chemistry—R. C. Kedzie, Agricultural College, Mich.; (D) Mechanical Science and Engineering—Thomas Gray, Terre Haute, Ind.; (E) Geology and Geography—J. J. Stevenson, New York; (F) Biology—J. M. Coulter, Bloomington, Ind.; (H) Anthropology—Joseph Jastrow, Madison, Wis.; (I) Economic Science and Statistics—Edmund J. James, Philadelphia, Pa. *Permanent Secretary,* F. W. Putnam, Cambridge (office, Salem), Mass. *General Secretary,* Harvey W. Wiley, Washington, D. C. *Secretary of the Council,* Amos W. Butler, Brookville, Ind. *Secretaries of the Sections,* (A) Mathematics and Astronomy—E. D. Preston, Washington, D. C.; (B) Physics—A. Macfarlane, Austin, Texas; (C) Chemistry—T. H. Norton, Cincinnati, Ohio; (D) Mechanical Science and Engineering—William Kent, New York, N. Y.; (E) Geology and Geography—W. J. McGee, Washington, D. C.; (F) Biology—A. J. Cook, Agricultural College, Mich.; (H) Anthropology—W. H. Holmes, Washington, D. C.; (I) Economic Science and Statistics—B. F. Fernow, Washington, D. C. *Treasurer,* William Lilly, Mauch Chunk, Pa.

WEDNESDAY, AUGUST 19TH.—In the afternoon the chairmen of the sections delivered their addresses. Prof. Stevenson, of Section E, spoke "On the Relations of the Chemung and Catskill on the Eastern Side of the Appalachian Basin." Prof. Coulter, of Section F, spoke "On the Future of Systematic Botany." The subject of the address of Prof. Jastrow, of Section H, was "The Natural History of Analogy." In the evening the retiring president, Prof. G. L. Goodale, delivered an address "On the Possibilities of Additions to our Cultivated and Useful Plants from New Sources."

The papers read in Sections E, F, and H were as follows:

THURSDAY, AUGUST 20TH.—*Section E.*—Source of Supply to Lateral and Medial Moraines, John T. Campbell. New Meteoric Iron from Arizona Containing Diamonds, A. E. Foote. Post-Glacial Anticlinal Ridges near Ripley and Caledonia, N. Y., G. K. Gilbert. Purposes of

Mountain-Building and Their Relationship to the Earth's Construction, Warren Upham. Notes on an Extinct Volcano at Montreal, Canada, Henry Lampard. On a New Horizon of Fossil Fishes, E. D. Cope. On the Cranial Characters of *Equus excelsus* Leidy, E. D. Cope. On Problematic Organisms and the Preservation of Algæ as Fossils, Joseph F. James. On the Age of the Mount Pleasant, Ohio, Beds, Joseph F. James. Preliminary Report of Observations at the Deep Well near Wheeling, W. Va., William Hallock. The Eureka Shale of Northern Arkansas, T. C. Hopkins.

Section F.—Notes on the Physiological and Structural Changes in Cayuga Lake Lampreys, Simon H. Gage. Notes on the Heart of Certain Mammals, Ida H. Hyde. The Transformation of the Vermilion-Spotted Newt, Simon H. Gage. On the Kinds of Motion of the Ultimate Units of Contractile Living Matter, John A. Ryder. On the Extinction of the Scapular and Pelvic Arches and Limbs of Lacertilia, E. D. Cope. On the Structure and Dimorphism of *Hypocrea tuberiformis*, Geo. F. Atkinson. Another Chapter in the History of the Venus Fly Trap, J. M. Macfarlane. On the Prothallium and Embryo of *Osmunda claytoniana* and *O. cinnamomea*, Douglas H. Campbell. A New Nectria, Byron D. Halsted. The Compositæ Collected by Dr. Edward Palmer in Colima, Joseph N. Rose. The Flora of Carmen Island, Joseph N. Rose. Uses of the Fermentation Tube in Bacteriology, with Demonstrations, Theobald Smith. The Foraminifera, with a New Device for the Exhibition of Specimens, James M. Flint.

Section H.—The Essentials of a Good Education, with a New Classification of Knowledge, Wm. H. Seaman. The Custom of Kava-Drinking as Practiced by the Paquans and Polynesians, Walter Hough. A Linguistic Map of North America, J. W. Powell. Jade Implements from Mexico and Central America, Thomas Wilson. Gold Ornaments in the United States National Museum from the United States of Colombia, Thomas Wilson. Siouan Onomatopes Interjections and Phonetic Types, J. Owen Dorsey. On a Collection of Stone Pipes from Vermont, G. H. Perkins. The Importance and Methods of the Science of Comparative Religion, Merwin Marie Snell.

FRIDAY, 21ST.—*Section E.*—Fossil Tracks in the Triassic of York county, Pa., A. Wanner. New Footprints of the Connecticut Valley, M. N. Mitievier. The Plant-Bearing Deposits of the American Trias, Lester F. Ward. A Reply to Professor Marsh's Note on Mesozoic Mammalia, Henry F. Osborn. Principles and Methods of Geologic Correlation by Means of Fossil Plants, Lester F. Ward. Exhibition of

Certain Bones of Megalonyx Not Before Known, James M. Safford. On the Probable Existence of a Second Driftless Area in the Mississippi Basin, R. D. Salisbury. The Cincinnati Ice Dam, Frank Leverett. The Structure of the Ouachita Uplift of Arkansas, Leon S. Griswold. The Relations of the Archean and the Algonkian in the Northwest, C. R. Van Hise. Results of a Well-Boring at Rochester, N. Y., Herman L. Fairchild.

Section F.—A Monograph of the Carolina Paroquet, Edwin M. Hasbrouck. Notes on Bacteria of Cucurbits, Byron D. Halsted. On Coloration in Certain Reptilia, E. D. Cope. Transpiration or the Loss of Water in Plants, Chas. E. Bessey and Albert F. Woods. Movements of Fluids in Plants, Wm. J. Beal. Absorption of Fluids by Plants, L. H. Pammel. Gases in Plants, J. C. Arthur. Notes Upon an Anthracnose, Byron D. Halsted. Origin and Development of Parasitic Habit in Mallophaga and Pediculidæ, Herbert Osborn. The Origin and Development of Parasitism Among the Sarcoptidæ, H. Garman. On the Habits of the Proctotrypidæ, Wm. H. Ashmead. The Biology of the Chalcididæ, L. O. Howard.

Section H.—An Experiment in Human Stirpiculture, Anita Newcomb McGee. Relics of Ancient Mexican Civilization, Zelia Nuttall. Bow Stretchers, Edward S. Morse. Prehistoric Bows, Edward S. Morse. The Nez Perce Country, Alice C. Fletcher. Relation of a Loveland, Ohio, Implement-Bearing Terrace to the Moraines of the Ice Sheet, Frank Leverett. Utility of Psychical Study of Child Life, Laura Osborne Talbott. Origin of the Name Chautauqua, Albert Gatschet.

SATURDAY, 22D.—*Section E.*—The Attitude of the Eastern and Central Portions of the United States During the Glacial Period, T. C. Chamberlin. Neocene and Pleistocene Continent Movements, W. J. McGee. Results of a Well-Boring at Rochester, N. Y., Herman L. Fairchild. On a Deep Bore near Akron, Ohio, E. W. Claypole. The Relations of the Archean and the Algonkian in the Northwest, C. R. Van Hise. A Study of the Fossil Avifauna of the Silver Lake Region, Oregon, R. W. Shufeldt. The Peninsula and Volcano Cosignina, J. Crawford. The Geological Survey of Nicaragua, J. Crawford. The Highest Old Shore Line on Mackinac Island, F. B. Taylor. Striæ and Slickensides at Alton, Illinois, J. E. Todd.

Section F.—Parasitism in Coleoptera, in Diptera, in Braconidæ, and Ichneumonidæ, C. V. Riley. Microörganisms as Insecticides, C. V Riley. Enemies of the Honey Bee, A. J. Cook. Notes on the Homology of the Hemipterous Mouth, John B. Smith. Epipharynx and Hypopharynx of Odonata, John B. Smith. The Mouth of the *Copris carolina,* and Notes on the Homology of the Mandible, John B. Smith. On the Phylogeny of the Archegoniata, Douglas H. Campbell. On the Turtles of the Genus Malaclemys, O. P. Hay. The President Condition of the Study of the Deep-Sea Fishes, G. Brown Goode. On the Injection of Blood from the Eyes of Horned Toads, O. P. Hay. Abnormal Bees, A. J. Cook. On the Importance of a Table at the Naples Station, Chas. W. Stiles. Further Observations on a Bacterial Disease of Oats, B. T. Galloway. Botanical Field-Work of the Botanical Division, George Vasey. Results from Recent Investigations of Pear Blight, M. B. Waite. The Spectroscope in Botanical Studies, I. S. Brashear. The Persistence and Relation of Faunal Realms, Theodore Gill. The New Zealand Fish Fauna, Theodore Gill. A Case of the Loss of Sense of Smell, Joseph Jastrow. A Novel Color Illusion and a New Method of Color Mixture, Joseph Jastrow. Modification of Habit in Paper-Making Wasps, Mary E. Murtfeldt. The Fate of the Fur Seal in American Waters (lantern illustrations), Wm. Palmer.

Section H.—An Ancient Human Cranium from Southern Mexico, F. W. Putnam. The Length of a Generation, C. M. Woodward. Burial Customs of the Hurons, Chas. A. Hirschfelder. The Messiah Religion and the Ghost Dance, James Mooney. Study of a Dwarf, Frank Baker. Stone Drills and Perforations in Stone from the Susquehanna River, Atreus Wanner. Evidences of the High Antiquity of Man in America, Thos. Wilson. On Bone, Copper, and Slate Implements Found in Vermont, G. H. Perkins. Some Archeological Contraventions, Gerard Fowke. On the Distribution of Stone Implements in the Tide-Water Province, W. H. Holmes. Aboriginal Novaculite Quarries in Arkansas, W. H. Holmes. Games of Teton Dakota Children, James Owen Dorsey. Geographical Arrangement of Prehistoric Objects in the U. S. National Museum, Thos. Wilson. Curious Forms of Chipped Stone Implements Found in Italy, Honduras, and the United States, Thos. Wilson. Inventions of Antiquity, Thos. Wilson. Study of Automatic Motion, Joseph Jastrow. Race Survivals and Race Mixture in Great Britain, W. H. Babcock.

Excursions.—On Saturday, Sunday, Monday, and Tuesday the following excursions were proposed for the association : To Luray, Va. (expense, $7.50) ; to Atlantic City ; Norfolk, and Virginia Beach, Va. (expense, $8.00) ; Baltimore ($2.00) ; Mount Vernon, Va. On account of the expense, some of these excursions were not or but little patronized. This was a unique feature in the history of the American Association.

On the evening of Friday the 21st, Prof. John M. Macfarlane, of Edinburg, delivered an address consisting of "Illustrations of Heredity in Plant Hybrids," which was illustrated by enlarged views of plant cell structures thrown on a screen.

At the conclusion of the lecture the council met and elected the following officers for 1892:

President, Prof. Joseph LeConte, of the University at Berkeley, Cal.; permanent secretary, Prof. F. W. Putnam, Cambridge, Mass.; general secretary, Prof. Amos W. Butler, Brookville, Ind.; council secretary, Prof. T. H. Horton, of Cincinnati University; and treasurer, William Lilly, Mauch Chunk, Pa. The vice presidents of sections number: A, Prof. J. R. Eastman, of the Naval Observatory, Washington; B, Prof. B. F. Thomas, State University, Columbus, Ohio; C, Dr. Alfred Springer, Cincinnati; D, Prof. J. B. Johnson, Washington University, St. Louis; E, Prof. H. S. Williams, Cornell University; F, Prof. S. H. Gage, Cornell University; H, W. H. Holmes, of the Ethnological Bureau; and I, Prof. S. Dana Horton, Pomeroy, Ohio.

Dr. H. Wheatland, of Salem, Mass., and Mr. Thomas Meehan were chosen auditors, and the following gentlemen will be the new secretaries of sections:

A, Prof. Winslow Upton, Brown University, Providence, R. I.; B, Prof. Browne Ayers, Tulane University, New Orleans; C, Prof. J L. Howe, Louisville Polytechnic Institute; D, Prof. O. H. Landreth, Vanderbilt University; E, Prof. R. D. Salisbury, University of Wisconsin; F, Prof. B. D. Halsted, Rutgers College, New Brunswick, N. J.; H, Dr. Stewart Culin, Philadelphia; and I, Lester F. Ward, of the Geological Survey, Washington.

The council was in receipt of a hearty invitation to select Rochester, N. Y., as the place of the next convention, and a ballot resulted in the choice being made.

A general session was held on the evening of Tuesday, August 25th, when the above officers and place of meeting were chosen for 1892. An invitation to meet in Chicago during the exposition in 1893 was presented by a Mr. Young in a speech commensurate with the anticipated grandeur of the event. Resolutions of thanks to the various entertaining bodies and authorities were adopted.

The Geological Society of America.—This organization commenced its session August 24th in the Columbian University building, Washington, D. C., and closed it on the evening of August 25th.

Owing to the death of the president, Prof. Alex. Winchell, the vice president, Mr. G. K. Gilbert, took the chair.

In opening the meeting the acting president, Mr. G. K. Gilbert, made a few brief remarks, in which he welcomed the society to Washington, and, in the name of President Welling, to the university. A touching memorial of the deceased president of the society, Alexander Winchell, was read by Prof. N. T. Winchell, brother of the deceased. The paper gave a sketch of the life and work of Prof. Winchell, and was a fitting tribute to a man who occupied his high position among geologists.

The following papers were read:

MONDAY, AUGUST 24TH.—A Geological Map of South America, Prof. Dr. Gustav Steinmann, University of Freiburg, Germany. On the Permian, Triassic, and Jurassic Formations in the East Indian Archipelago (Timor and Rotti), Dr. August Rothpletz, University of Munich, Germany. Thermometamorphism in Igneous Rocks, Mr. Alfred Harker, St. John's College, Cambridge, England. The Lower Silurian (Ordovician) Ichthyic Fauna, and Its Mode of Occurrence, C. D. Walcott. Relations of the Plant-Bearing Deposits of the American Trias, Lester F. Ward. Studies in Problematic Organisms: The Genus Scolithus, Joseph F. James. The Tertiary Iron Ores of Arkansas and Texas, R. A. F. Penrose, Jr. Contribution to the Geology of the Plains, Sandstone Dikes in Northwestern Nebraska, Robert Hay. Some Recent Experimental Reproductions of Scottish Mountain Structures, Henry M. Cadell, Esq., Scotland. Mechanics of Appalachian Structure (with lantern illustrations), Bailey Willis.

TUESDAY, AUGUST 25TH.—The Relations of the Fossil Echinoid Faunas of Europe and America, Mr. John Walter Gregory, British Museum, London, England. On the Eurypterus Beds of Oesel as Compared with Those of the Waterlime of North America, Dr. Friedrich Schmidt, Academy of Sciences, St. Petersburg, Russia. Sur les Couches Marines Terminant le Jurassique et Commençant le Crétace et sur l'Histoire de leur Faune, Prof. Alexis Pavlow, University of Moscow, Russia. Sur l'Homme Contemporain du Mammouth en Belgique, Prof. Max Lohest, University of Liége, Belgium. On the Quaternary Changes of Level in Scandinavia, Baron Gerald de Geer, State Geologist, Stockholm, Sweden. The Black Earth of the Steppes of Southern Russia: Its Origin, Distribution, and Points of Resemblance With the Soils of the American Prairies, Prof. A. Krassnof. Sur l'Existence du Dinotherium en Roumaine, Prof. Gregoire Stefanescu, University of Bucharest, Roumania. The Present Standing of the Several Hypotheses of the Cause of the Glacial Period, Thomas C. Chamberlin. On the Northward and Eastward Extension of Pre-pleistocene Gravels in the Basin of the Mississippi; On Certain Extra Morainic Drift Phenomena of New Jersey, R. D. Salisbury. Inequality of Distribution of the Englacial Drift, Warren Upham. Defloration and Deformation of Alluvial Deposits in New England, Homer T. Fuller. The Elæolite Syenite of Beemerville, N. Y., J. F. Kemp. On the Separation and Study of the Heavy Accessories of Rocks, Orville A. Derby. Contributions to the Areal Geology of the Texas-New Mexico Region: (*a*) The Tertiary History of the Rio Grande Embayment; (*b*) The Llano Estacado and Edwards Plateau; (*c*) The Basin Formations of New Mexico, and Accompanying Volcanic Craters; (*d*) The Las Vegas Raton Plateau, R. T. Hill. The Missouri Coal Measures and the Conditions of their Deposition, Arthur Winslow. The Well's Creek Basin and Uplift in Stewart and Houston Counties, Tennessee; The Pelvis of the Megalonyx, and the Lot of Undescribed Bones Among which It is Found, from Big Bone Cave, in Tennessee, James M. Safford. The Cienegas of Southern California; A Description and Discussion of Their Geological Structure and Origin, E. W. Hilgard. Notes on the Crystalline Rocks of Central Texas, with Maps, T. B. Comstock. On a Deep Boring near Akron, Ohio, and Its Significance, E. W. Claypole. The Natural Bridges of Florida and the Chattahoochee Embayment, Lawrence G. Johnson. On Some Peculiar Causes which are Influencing Topographical Changes and Geological Formations in the Channel Islands of California, Lorenzo G. Yates.

The International Geological Congress.—This body met in the Columbian University, Washington, D. C., from August 26th to September 2d, inclusive. The officers of the meeting were: Honorary presidents, J. D. Dana, James Hall. President, J. S. Newberry. Vice presidents—United States, Joseph Le Conte, J. W. Powell, and Raphael Pumpelly; Canada, J. C. K. Laflamme and W. Macfarlan; Mexico, A. del Castillo; England, T. McK. Hughes; Scotland, H. M. Cadell; France, A. Gaudry and Charles Barrois; Belgium, E. Van den Broeck; Holland, G. A. F. Molengraaff; Norway, H. Reusch; Sweden, Gerard de Geer; Russia, Th. Tschernychew, F. Schmidt, and A. Pavlow; Denmark, Dr. Johnstrup; Germany, Dr. Von Zittel and H. Credner; Austria, Dr. E. Tietze; Hungary, Joseph Von Szabo; Spain, M. F. de Castro; Portugal, Joaquin Filippe Nery Delgado; Italy, Prof. G. Uzielli; Switzerland, H. Golliez;

Roumania, G. Stefanescu; India, F. R. Mallet; New Zealand, F. Hutton; Australia, Arch. Liversidge; Chili, F. J. San Roman. General Secretaries, H. S. Williams, S. F. Emmons. Secretaries, J. C. Branner, Emm. de Margerie, G. H. Williams, Dr. F. Frech, Dr. Diener, Whitman Cross. Treasurer, Arnold Hague.

Owing to the illness of Prof. Newberry the chair was taken by Prof. T. McKenna Hughes, of England; Prof. Karl Von Zittel, of Munich; Prof. Albert Gaudry, of Paris; and by Prof. Joseph LeConte, first vice president. Prof. Hughes made the opening address, and was succeeded by the Hon. Gardner C. Hubbard, of Washington, in an address of welcome from the city. On behalf of the president and the government Hon. J. S. Noble, Secretary of the Interior, delivered an address of welcome, which was followed by a few remarks from Major J. W. Powell.

The program of proceedings was as follows:

WEDNESDAY, AUGUST 26TH.—10 A.M., meeting of the council for nomination of bureau. 2 P.M., opening of the congress, election of bureau, addresses, etc. 9 P.M., reception at the Arlington Hotel by the Geological Society of America.

THURSDAY, AUGUST 27TH.—10 A.M., meeting of the council. 11 A.M., morning meeting of congress. 2.30 P.M., afternoon meeting of congress. Evening reception by Mr. and Mrs. S. F. Emmons, at 1725 H Street, 10 P.M., and by Mr. and Mrs. Thomas Wilson, 1218 Connecticut Avenue.

FRIDAY, AUGUST 28TH.—10 A.M., meeting of council. 11 A.M., morning session of congress. 2.30 P.M., afternoon session of congress. Evening, the National Museum was opened to members of the congress.

SATURDAY, AUGUST 29TH.—10 A.M., morning session of congress. Afternoon, no special program made.

MONDAY, AUGUST 31ST.—10 A.M., meeting of council. 11 A.M., morning session of congress. Evening, 9 to 11, reception by the director and members of the Geological Survey at 1330 F Street.

TUESDAY, SEPTEMBER 1ST.—10 A.M., meeting of council. 11 A.M., closing session of congress. Afternoon, excursion on the Potomac, on steamer furnished by the committee, and dinner at Marshall Hall.

It had been recommended by the managing committee that the discussion open on the following topic:

I. Time correlation of the clastic rocks.
    1. Correlation by structural data.
        a. By stratigraphical data.
        b. By lithological data.
        c. By physiographical data.
    2. Correlation by paleontological data.
        a. By fossil plants,
        b. By fossil animals,
        or
        a. By marine fossils.
        b. By terrestrial fossils.
II. General geological color schemes and other graphic conventions.
III. Genetic classification of the Plistocene rocks.

The consideration of the first division of the above plan was taken up by the presentation of a synopsis of the subject by Prof. G. K. Gilbert. The third part of the subject was opened by the presentation of two systems of glacial phenomena, one by President Chamberlin and the other by Mr. W. T. McGee. The discussion was as follows:

Prof. Gaudry spoke as follows: In the Parisian basin there are two different horizons distinguished by different faunas, the one indicating a cold, the other a warm climate. It is, however, impossible to decide which of these two periods was the earlier. In England the same condition of affairs is to be observed. In Germany there is but one Quaternary fauna, which indicates a cold climate, whilst in Italy the fauna of the cold period is absent.

Prof. H. Credner: The North German plain contains deposits closely related to those of the Plistocene in America. Prof. Chamberlin's classification is admirable and wholly applicable to Germany.

Baron de Geer expressed his approbation of the classification proposed by Prof. Chamberlin. He had for some years been advocating a similar classification for Scandinavia. A few minor alterations might be suggested to suit Scandinavian conditions; for instance, the marine deposits might be made a separate class; classes IV. and V. of Prof. Chamberlin could, perhaps, be reduced to subclasses under III., as the formations frequently seem to be accidental or local. He agreed with the distinction suggested between osars and kames,—that is, that the former are in the main radial and the latter peripheral with reference to the distribution of land ice.

Prof. T. McK. Hughes pointed out that the classification given by Prof. Gaudry was purely chronological, whereas that suggested by Prof. Chamberlin was purely genetic. He then explained the abundance of striated boulders in one part of the glacial deposits and their absence in another. If the supply of material (that is, of rock bosses above the ice) ceases at any point, then all the boulders will gradually sink through the ice and become glaciated at the bottom. Prof. Hughes also thought that two distinct types of ridges formed of glacial material were confused under the names kames, osars, and eskar. He also explained that "pitted plains" as due to an unusual interruption between the hills or ridges of eskar character. He expressed his opinion that the Glacial period was a continuous one, in England at least, except for slight changes due to unimportant oscillations.

Dr. Wahnschaffe advocated the chronological classification, and considered such a one possible for the Quaternary deposits of North Germany. These deposits begin with pre-Glacial sands and gravels containing *Paludina diluviana,* which is still a living form, and *Lithoglyphus naticoides.* Above these follows a typical ground moraine, which is overlaid by stratified sand and gravel, containing the well-known diluvial fauna; and to these again succeeds the upper till, considered now as the ground moraine of the second glacial epoch.

Prof. H. Credner: The occurrence of the sand between two ground moraines indicates a retreat and second advance of the ice sheet. Such interpolated sands are in Germany always local, and no proof of a real interglacial epoch. The sand layers between the moraines are not continuous, but local, and cannot be given the significance attributed to them by Wahnschaffe.

Prof. Pavlow: In order to secure a satisfactory classification of Quaternary deposits, we must secure a satisfactory definition of Pleistocene. Prof. Pavlow said he would like to give his own views, but would postpone them until such accepted definition had been arrived at.

Baron de Geer agreed with Wahnschaffe that the chronological classification is at least locally possible. He also recognized two glacial epochs, due to two great oscillations. These cannot always be separated, as, for instance, in Russia. For this reason it is best to commence with a genetic classification, since this causes less confusion to the field geologist.

Dr. Wahnschaffe replied to Prof. Credner's assertion that there is no proof of an interglacial period in Northern Germany. He that that the existence of a diluvial fauna between the two tills is sufficient proof.

Prof. Credner replied that no complete skeleton had been found, but only single bones which might have been transported and deposited with the gravel.

Dr. Wahnschaffe again replied that the bones occurring in these gravels are proportionately large, when compared with the gravels themselves, and therefore cannot well have been transported from a distance.

Prof. Shaler: Organic deposits may possibly occur very near the ice sheet, which allows an interweaving of organic and glacial deposits.

Mr. G. K. Gilbert remarked on the observation of I. C. Russel in Alaska, that where the movement of the ice is very sluggish it may become covered with soil, or even with a growing forest, in which such animals as bears still live.

Dr. Diener remarked that intercalated beds of sand were no positive proof of interglacial periods. In the Austrian Alps moraines no more than twenty years old are covered with pasture, and in the Caucausas the rhododendron grows to the very edge of the ice.

Dr. Holst mentioned two moraines separated by interpolated sand, and thought that they might both have been formed by the same ice sheet. The melting of the ice leaves un unoxidized (blue) ground moraine, with an overlaying oxidized (yellow) upper moraine. This also occurs in Northern Sweden, where there is no indication of a retreat of the ice.

Baron de Geer could not understand the occurrence of thirty or forty feet of stratified sand between two moraines of the same glacier. The colors are sometimes the reverse of what has been stated by Dr. Holst, and the boulders in the two moraines have been derived from different sources.

Mr. Christie described the section of peat and silt between two layers of till occurring on the river Clyde, above Glasgow.

Mr. Cadell described some five distinct layers of till occurring in a pre-Glacial river channel in Eastern Scotland; and also mentioned another river channel, filled with coarse gravel derived from rocks occurring farther north in Scotland, which was covered with a later layer of boulder clay.

Mr. McGee mentioned the importance of land forms in interpreting geological processes. Any primary geological classification must be genetic. He discussed in detail the following scheme of classification of Plistocene deposits:

Classification of Plistocene Formations and Land Forms.

A. Aqueous:
  1. Below base level.
    a. Marine.
    b. Estuarine.
    c. Lacustral.

- 2. At bass level.
    - *a.* Littoral.
    - *b.* Marsh.
    - *c.* Alluvial (certain terraces, etc.)
- 3. Above base level.
    - *a.* Torrential.
    - *b.* Talus (including playas).

B. Glacial:
- 1. Direct. (Chamberlin's class I.)
- 2. Indirect. (Chamberlin's classes II. to V., in part.)

C. Aqueo-Glacial: (Chamberlin's classes II. to V., in part.)

D. Eolic: (Chamberlin's class (?) VI.)
- 1. Direct.
    - *a.* Lava sheets.
    - *b.* Cinder cones.
    - *c.* Tuffs, lapilli sheets, etc.
- 2. Indirect.
    - *a.* Ash beds.
    - *b.* Lapilli sheets.

Prof. Chamberlin, in closing the discussion, said that there was great difficulty in applying a chronological classification, and that such a classification might even act as a barrier to observation and to the recognition of the truth. Chronological classification is the ultimate goal of glacial studies, but it is something for which we are not as yet prepared. Red, oxidized subsoils are not developed in northern latitudes. Organic deposits between glacial layers are abundant in the west, but do not belong to a single horizon. Many facts of erosion and physical geology indicate that the Glacial epoch in America was widely differentiated, and of long duration. How many distinct periods it embraced we do not as yet know.

Prof. Cope: An abundant tropical fauna is found in the "Equus beds," which, if they be of interglacial age, indicates at this time a warm climate. This fauna is succeeded by a truly boreal fauna. In this is contained material for a chronological subdivision of Pleistocene deposits.

Prof. Gaudry read the following remarks at the close of the congress:

Mr. President and Ladies and Gentlemen:

We regret that Prof. Joseph Prestwich, president of the fourth international geological congress, was not able to be present to install the officers of the fifth congress, but we are pleased that he should have delegated in his place Prof. Hughes, who is so appreciated by all geologists. We regret also that Prof. Newberry is not in attendance to preside over our deliberations, as we had hoped. In the excellent work which he has recently published on the fossil fishes we were shown a sample of his vigor and his spirit, but unhappily his physical strength would not permit him to attend at our call, and preside over this congress. But to console us we have chosen another eminent geologist, Prof. Joseph LeConte. In the name of my brother geologists I have to thank him for the talent and kindness with which he has directed our session. It is now thirteen years since we organized at Paris the first international congress of geologists. My friends MM. Delaire and Barrois, who are here with us to-day, and who were secretaries of that first congress, can tell you that we were not then without inquietitude for its success. Thanks to the Lord and thanks to you, it has developed into a complete success. We ought not to forget that if it was at Paris that the first congress was organized, it was in America that the project was started. Hence sprang the generous and fecund idea to unite the different members of the great family of geologists. I am but the interpreter of the sentiments of my brother members of the international congress of geologists, whether present or absent, in addressing the most cordial thanks to the American savants who were the inspiration of this congress. The congresses at Bologna, Berlin, and London had grand success, while this at Washington is not less satisfying. In truth, we have not made any new regulations, and the anterior congresses made many. There are regulations for nearly everything *en peu faut, pas n'en faut.* We should guard against personality, and ought always to respect the liberty of science. It is most important that we should elevate science in the greatest degree possible. Our domain is immense, since we make the history of all the earth. We should give to our spirits an amplitude equal to that of the vast domain which we are charged to explore. By the natural force of things each one of us is drawn to study special branches; in order to make original work, one must concentrate his power upon a single branch of science. Some of us are pleased to make our researches among the vertebrates,—strange and gigantic animals which peopled our continents in past times Others attach themselves to the study of invertebrates,—creatures humbler, but which render great service to geology in the determination of the ages of the earth. Still others consider the flora, and make corresponding classifications. Some prefer the primitive *terrains* which reveal to us the origin of life, while still others prefer the secondary and Tertiary *terrains*, which show the world in a more advanced state, and so continue the mystery of the origin of humanity. Many of our brethren occupy themselves with physical or chemical geology. We have reason to hope much from this division of labor. It is necessary that at certain periods we should collect all the products of our activity, that we should show to the world wherever interested, and to our brother geologists, the various processes by which we have arrived at our conclusions. Each one of us is but a minimum, but the entirety of our knowledge will form a marvelous structure, and one of great strength. Such is the work of our international congress.

Gentlemen, we have the good fortune to be co-workers, and as such we should love and be loved by one another. I believe I am the oldest of all the geologists who have crossed the Atlantic Ocean to attend this congress. I have met many ardent workers in my life, and I declare to you in all the sincerity of my soul that the more I see and the better I know the men of science the more and better I love them. It is a long time since we learned to admire the American geologists, but we come now to learn to love them. In returning to our homes in the Old World we will carry with us a cherished souvenir of the members of the international congress of geology at Washington.

The following names were recorded as the Founders' Committee: James Hall, T. Sterry Hunt, J. W. Dawson, J. S. Newberry, C. H. Hitchcock, R. Pumpelly, J. P. Lesley, T. H. Huxley, O. Torell, E. H. de Baumhauer.

The following members of the congress were present from foreign countries: *Austria-Hungary*—Dr. Karl Diener, a. d. k. k. Universität, Wien; Dr. Emil Tietze, Chefgeolog des K. K. geol. Reichsanstalts, Wien. *Belgium*—Prof. Max. Lohest, à l'Université, Liége; Dr. Xavier Stainier, Com. géol. de Belgique, Bruxelles; Mr. E. Van Broeck, Commission géoligique de Belgique, Bruxelles; *Canada*—Frank D. Adams, McGill College, Montreal; Thomas MacFarlane, Inland Revenue Dept., Ottawa. *France*—Prof. Dr. Charles Barrois, à l'Université, Lille; Mr. Marcellin Boule, du Muséum d'hist. nat., Paris; Prof. Albert Gaudry, du Muséum d'hist. nat., Paris; Mr. Emm. de Margerie, Service de la carte géol. de la France, Paris. *Germany*—Prof. Dr. Achilles Andreae, an der Universität, Heidelberg; Prof. Dr. E. W. Benecke, an der Universität, Strassburg; Dr. Alfred Bergeat, München; Dr. Georg von dem Borne, Halle; Prof. Dr. Hermann Credner, an der Universität, Leipzig. Prof. Rudolf Credner, an der Universität, Greifswald; Dr. F. Frech, an der Universität, Halle; Dr. Otto Jaekel, an der Universität, Berlin; Prof. Dr. Emanuel Kayser, an der Universität, Marburg; Dr. W. Koenigs, an der Universität, München; Dr. Carl Ochsenius, an der Universität, Marburg; Dr. Alfred Osann, an der Universität, Heidelberg; Herr Felix Plieninger, München; Herr Julius Romberg, Berlin; Dr. August Rothpletz, an der Universität, München; Herr Ulrich Söhle, München; Prof. Dr. G. Steinmann, an der Universität, Freiburg; Dr. Arnold, Ulrich, an der Universität, Strassburg; Herr Adolf Viedenz, Bergrath, Eberswalde-Berlin; Dr. Felix Wahnschaffe, an der Universität, Berlin; Dr. Bruno Weigand, Strassburg; Dr. Baron Sidney von Wöhrmann, München; Dr. E. A. Wülfing, an der Universität, Tübingen; Prof. Dr. von Zittel, an der Universität, München. *Great Britain*—John W. Gregory, Esq., F.G.S., British Museum, London; Alfred Harker, Esq., F.G.S., St. John's College, Cambridge, Eng.; Prof. T. McKenny Hughes, Esq., F.R.S., F.G.S., Cambridge University, Cambridge, Eng.; Mrs. Mary C. Hughes, Cambridge, Eng.; Hugh Leonard, Esq., late Chief Engineer Indian Pub. Works Dep't, London; Lieut.-Col. A. O. Tabuteau, F.G.S., Bath, Eng. *Mexico*—Antonio del Castillo, Dir. de l'École des Ingènieurs, City of Mexico. *Norway*—Dr. Hans Reusch, Director of the Geological Survey of Norway, Christiana. *Roumania*—Prof. Stefan Sihleana, à l'Université, Bucharest; Mdme. Henriette Sihleano, Bucharest; Prof. Grégoire Stefanescu, à l'Université, Bucharest; Mdme. Maria G. Stefanescu, Bucharest. *Russia*—Prof. A. N. Krassnof, à l'Université, Charkow; Prof. Alexis Pavlow, à l'Université, Moscow; Mdme. Marie Pavlow, Moscow; Prof. F. Schmidt, Comité géologique de la Russie, St. Petersburg; Prof. P. Tschernyschew, Comité géologique de la Russie, St. Petersburg. *Sweden*—Gerard de Geer, Geological Survey of Sweden, Stockholm; Nils Olaf Holst, Geological Survey of Sweden, Stockholm; Hjalmar Lundbohm, Geological Survey of Sweden, Stockholm; Prof. Hjalmar Sjögren, at the University, Upsala. *Switzerland*—Prof. H. Gollier, à l'Université, Lausanne; Prof. Dr. C. Schmidt, à l'Université, Bâle.

An excursion to the Rocky Mountains under the guidance of the U. S. Geological Survey followed the adjournment of the congress. On reaching Salt Lake the party divided, one part visiting the Grand Canyon of the Colorado, the other the Yellowstone Park. A remarkable peculiarity of this excursion was the fact that it was made at the expense of the visitors, the hosts charging each of them $265.